



# Standard Specification for Performance of Fittings for Use with Gasketed Mechanical Couplings Used in Piping Applications<sup>1</sup>

This standard is issued under the fixed designation F1548; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification defines classification, materials, test requirements, inspection certification, marking and packaging of fittings for use with gasketed mechanical couplings complying to Specification F1476.

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

NOTE 1—See Table 1 for equivalency listing of applicable, equivalent specifications.

- A47/A47M Specification for Ferritic Malleable Iron Castings
- A48/A48M Specification for Gray Iron Castings
- A53/A53M Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- A153/A153M Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- A216/A216M Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
- A234/A234M Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
- A312/A312M Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
- A395/A395M Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
- A403/A403M Specification for Wrought Austenitic Stainless Steel Piping Fittings
- A536 Specification for Ductile Iron Castings
- A743/A743M Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.11 on Machinery and Piping Systems.

Current edition approved May 1, 2012. Published May 2012. Originally approved in 1994. Last previous edition approved in 2006 as F1548 – 01 (2006). DOI: 10.1520/F1548-01R12.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- B26/B26M Specification for Aluminum-Alloy Sand Castings
- B75 Specification for Seamless Copper Tube
- B210 Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
- B369 Specification for Copper-Nickel Alloy Castings
- B580 Specification for Anodic Oxide Coatings on Aluminum
- B584 Specification for Copper Alloy Sand Castings for General Applications
- B633 Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- F1476 Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications

### 2.2 ANSI Standards:<sup>3</sup>

- B 36.10 Welded and Seamless Wrought Steel Pipe
- B 36.19 Stainless Steel Pipe
- Z 540.1 Calibration Laboratories in Measuring Test Equipment

### 2.3 ANSI/AWWA Standards:<sup>3</sup>

- C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and Other Liquids
- C606–87 Grooved and Shouldered Joints

### 2.4 British Standards:<sup>4</sup>

- BS 729 Specification for Hot Dip Galvanized Coatings on Iron and Steel Articles
- BS 1400 Specification for Copper Alloy Ingots and Copper Alloy and High Conductivity Copper Castings
- BS 1452 Specification for Flake Graphite Cast Iron
- BS 1471 Specification for Wrought Aluminum and Aluminum Alloys for General Engineering Purposes—Drawn Tube
- BS 1490 Specification for Aluminum and Aluminum Alloy Ingots and Castings for General Engineering Purposes
- BS 1640 Pt. 1 Wrought Carbon and Ferritic Alloy Steel Fittings

<sup>3</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

<sup>4</sup> Available from British Standards Institute (BSI), 389 Chiswick High Rd., London W4 4AL, U.K., <http://www.bsi-global.com>.

**TABLE 1 Specification Equivalency Table**

Spec. Ref. Number	U.S. Designation ASTM	British Standard	ISO Standard
1	A47/A47M	6681	5922
2	A48/A48M	1452	—
3	A53/A53M	3601	—
4	A153/A153M	729	1459, 1460, 1461
5	A216/A216M	3100	—
6	A234/A234M	1640 Pt. 1	—
7	A312/A312M	3605	—
8	A395/A395M	—	—
9	A403/A403M	1640 Pt. 2	—
10	A536	4772	2531, 4179, 8179
11	A743/A743M	3100	—
12	B26/B26M	1490	3522, 7722
13	B75	2871	—
14	B210	1471	209
15	B369	3071	—
16	B580	—	—
17	B584	1400	—
18	B633	1706	2081
ANSI			
19	B36.10	3600	4200
20	B36.19	3600	4200
21	Z 540.1	5781	—
ANSI/AWWA			
22	C151/A21.51	4772	2531, 4179, 8179
23	C606–87	—	—

**BS 1640 Pt. 2** Wrought and Cast Austenitic Chromium—Nickel Steel Fittings

**BS 1706** Method for Specifying Electroplated Coatings of Zinc and Cadmium on Iron and Steel

**BS 2871** Specification for Copper and Copper Alloys—Tubes

**BS 3071** Specification for Nickel—Copper Alloy Castings

**BS 3100** Specification for Steel Castings for General Engineering Purposes

**BS 3600** Specification for Dimensions of Steel Pipe for the Petroleum Industry

**BS 3601** Specification for Carbon Steel Pipes and Tubes with Specified Room Temperature Properties for Pressure Purposes

**BS 3605** Austenitic Stainless Steel Pipes and Tubes for Pressure Purposes

**BS 4772** Specification for Ductile Iron Pipes and Fittings

**BS 5781** Measurement and Calibration System

**BS 6681** Specification for Malleable Cast Iron

2.5 *International Standards Organization*.<sup>5</sup>

**209** Composition of Wrought Products of Aluminum and Aluminum Alloys . . . Chemical Composition (Percent)

**1459** Metallic Coatings—Protection Against Corrosion by Hot Dip Galvanizing—Guiding Principles

**1460** Metallic Coatings—Hot Dip Galvanized Coatings on Ferrous Materials—Determination of the Mass Per Unit Area—Gravimetric Method

**1461** Metallic Coatings—Hot Dipped Galvanized Coatings on Fabricated Ferrous Products—Requirements

**2081** Metallic Coatings—Electroplated Coatings of Zinc on Iron or Steel

**2531** Ductile Iron Pipes, Fittings and Accessories for Pressure Pipe Lines

**3522** Cast Aluminum Alloys—Chemical Composition and Mechanical Properties

**4179** Ductile Iron Pipes for Pressure and Non-Pressure Pipelines—Centrifugal Cement Mortar Lining—General Requirements

**4200** Plain End Steel Tubes, Welded and Seamless—General Tables of Dimensions and Masses Per Unit Length

**5922** Malleable Cast Iron

**7722** Aluminum Alloy Castings Produced by Gravity, Sand, or Chill Casting, or by Related Processes—General Conditions for Inspection and Delivery

**8179** Ductile Iron Pipes—External Zinc Coating

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *fabricated fitting*—a fitting constructed by welding together sections of pipe or tube.

3.1.2 *fitting*—a device used in a piping system to change pipe direction, size, split or combine flows, or adapt to other joining methods.

3.1.3 *grooved end*—type of fitting or pipe end having a groove for use with grooved mechanical couplings (Type I) as defined in **F1476**.

3.1.4 *pipe*—hollow tubular product conforming to **Table 1** Specification Reference Nos. 19, 20, 22 and 13, Nominal Dimensions, or O.D. tube.

3.1.5 *plain end*—type of fitting or pipe end for use with a gasketed mechanical coupling (Type II) that is plain end as defined in Specification **F1476**.

3.1.6 *tangent*—a section of straight pipe or tube integral to or welded to the end(s) of a fitting.

3.1.7 *wrought fitting*—a fitting made by shaping or shaping and welding.

### 4. Classification

4.1 These fittings are classified into the following design types:

4.1.1 *Type I*—Grooved end.

4.1.2 *Type II*—Plain end.

### 5. Ordering Information

5.1 Orders for fittings under this specification shall include the following:

5.1.1 Specification designation, title, number and year of issue.

5.1.2 Quantity.

5.1.3 Size and appropriate suffix (Example 8 in. IPS, 76.1 mm O.D.).

5.1.4 Fitting description (90° Elbow, Tee, Cross, etc.).

<sup>5</sup> Available from International Organization for Standardization (ISO), 1 rue de Varembe, Case postale 56, CH-1211, Geneva 20, Switzerland, <http://www.iso.ch>.

5.1.5 Type (I, II)—Type I must include groove style (that is, Standard, End Seal,<sup>6</sup> AWWA Rigid, AWWA Flexible, or Copper).

5.1.6 Minimum pressure rating.

5.1.7 Material (ductile iron or steel, aluminum, copper nickel, copper, other, etc.) (see Section 6).

5.1.8 Finish (painted, galvanized, bare, plated, special coatings) (see Section 6).

5.1.9 Other requirements agreed to between purchaser and fitting manufacturer.

## 6. Materials and Manufacture

6.1 *Ferrous Materials*—Cast fittings shall be constructed of ductile iron in accordance with **Table 1** Specification Reference 8 or 10 Grades 65–45–15 or 65–45–12 respectively or Malleable Iron in accordance with **Table 1** Specification Reference 1 or steel in accordance with **Table 1** Specification Reference 5 or Cast Iron in accordance with **Table 1** Specification Reference 2. Wrought fittings shall be made in accordance with **Table 1** Specification Reference 6. Fabricated fittings and tangents shall be constructed of steel in accordance with **Table 1** Specification Reference 3.

6.1.1 Fitting shall be bare, coated with manufacturer's standard preparation and paint, hot-dip galvanized in accordance with **Table 1** Specification Reference 4 or other finish as agreed upon between purchaser and manufacturer.

6.2 *Aluminum Alloy Materials*—Fittings shall be constructed of aluminum alloy in accordance with **Table 1** Specification Reference 12. Fabricated fittings shall be made from pipe in accordance with **Table 1** Specification Reference 14.

6.2.1 Finish for aluminum alloy fittings shall be bare, anodized in accordance with **Table 1** Specification Reference 16 or as otherwise agreed between purchaser and manufacturer.

6.3 *Iron-Chromium-Nickel, Corrosion Resistance Materials*—Fittings shall be constructed of iron-chromium-nickel alloy in accordance with **Table 1** Specification Reference 11, or **Table 1** Specification Reference 9. Welded tangents and fabricated fittings shall be in accordance with **Table 1** Specification Reference 7.

6.3.1 Finish for iron-chromium-nickel shall be bare or as otherwise agreed between purchaser and manufacturer.

6.4 Copper or brass, cast fittings shall be constructed of brass in accordance with **Table 1** Specification Reference 17. Wrought fittings shall be constructed of copper in accordance with **Table 1** Specification Reference 13.

6.4.1 Finish for copper or brass fittings shall be bare or as otherwise agreed between purchaser and manufacturer.

6.5 Copper-nickel cast fittings shall be constructed of copper-nickel in accordance with **Table 1** Specification Reference 15 as applicable.

6.5.1 Finish for copper-nickel fittings shall be bare or as otherwise agreed between purchaser and manufacturer.

6.6 *Other Materials*—Where other materials are required, the material, mechanical properties and finish of the products shall be as agreed upon by the fitting manufacturer and the purchaser.

6.7 *Material Quality*:

6.7.1 The material shall be of such quality and purity that the finished product shall have the properties and characteristics to meet the performance requirements of this standard.

6.7.2 The manufacturer is encouraged to use materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term “recovered materials” means: “Materials which have been collected or recovered from solid waste and reprocessed to become a source of raw material, as opposed to virgin raw materials.” Used or rebuilt products shall not be used.

## 7. Other Requirements

7.1 *Design Requirements*:

7.1.1 The design of the fittings may be qualified by mathematical analysis in accordance with piping codes agreed to by manufacturer and purchaser or by testing. Fittings that are tested shall be tested with gasketed mechanical couplings in accordance with the test requirements of Specification **F1476**.

7.2 *Qualification Requirements* :

7.2.1 *Mathematical Analysis*:

7.2.1.1 A mathematical analysis, where appropriate, shall be performed as required by the governing piping code. Records of the analysis shall be available at the manufacturer's facility for inspection by the purchaser.

7.2.2 *Test*:

7.2.2.1 The fittings shall be tested, where appropriate, with gasketed mechanical couplings in accordance with the requirements of Specification **F1476**. Unless otherwise noted herein, all requirements of Specification **F1476** apply. Records of successful tests shall be available at the manufacturer's facility for inspection by the purchaser.

7.2.3 Each type, pressure class, and material of fitting offered for sale must be qualified. Interpolation between qualified sizes is allowed as defined in Specification **F1476**. Qualification of the fitting requires successful completion of the analysis or required testing. Each fitting design is only qualified for use with the GMC design on which it was tested or analyzed.

## 8. Dimensions, Mass and Permissible Variations

8.1 *Fitting Dimensions*—Fitting dimensions and tolerance shall be as specified by the manufacturer.

## 9. Workmanship, Finish, and Appearance

9.1 All fitting surfaces shall be free from scale, blisters, fins, folds, seams, laps, burrs and cracks, which would affect the suitability for the intended service.

## 10. Inspection

10.1 *Terms of Inspection*:

10.1.1 Inspection of the fittings shall be in accordance with the manufacturer's standard inspection procedure or as agreed

<sup>6</sup> End seal is a registered trademark of the Victaulic Company of America.

upon between the purchaser and the manufacturer or supplier as part of the purchase contract.

**10.2 Raw Material Inspection:**

10.2.1 Raw material shall be inspected for compliance with its material specification.

**10.3 Quality Conformance Inspection:**

10.3.1 Fitting samples shall be visually and dimensionally examined to verify compliance with the manufacturer's appropriate drawings.

**10.4 Process Control Inspection :**

10.4.1 Fittings shall be inspected throughout the entire manufacturing and processing cycle. Methods of inspection shall be in compliance with manufacturer's quality assurance procedures.

**10.5 Inspection Records:**

10.5.1 Inspection records shall be maintained by the manufacturer. The length of time on file shall be in accordance with the manufacturer's quality assurance procedures.

**11. Certification**

**11.1 Material Certification:**

11.1.1 A certification of compliance shall be obtained from the materials supplier, when applicable. This certificate shall state that applicable requirements for the raw material have been satisfied.

**12. Product Marking**

12.1 Each fitting shall be marked with the manufacturer's name or trademark, size, and markings traceable to the material and pressure rating.

**13. Packaging**

13.1 The fitting shall be boxed, crated, wrapped and otherwise protected during shipment and storage in accordance with manufacturer's standard practice. Care shall be taken to properly protect the fitting from damage during shipment and storage.

**14. Keywords**

14.1 fitting; grooved; marine; ship; tangent

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